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EVALUATION OF PROCESSING TOMATO BREEDING LINES AND CULTIVARS FOR MECHANICAL HARVESTING AND QUALITY IN 1986

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INTRODUCTION

Tomatoes continue to be the most important processed crop in Ohio with a harvested acreage in 1986 of over 16,000 acres and about 400,000 ton production; yield per acre has continued at a record level of over 25 tons/acre. Harvest in Ohio started in the central area of he state the latter part of July. Although processing tomato production is concentrated in the northwest area of the state, there is an effort to develop an earlier production area in south-central Ohio. Harvest in the main northwest production area of the state began in early August and was almost complete by the end of September. Excess moisture caused some water damage earlier in the season, especially on heavier soil sites. Rains continued frequent the early part of the summer and in general growing conditions tended to be satisfactory the remainder of the season. New planting practices, growing methods, machine harvest-bulk handling and new processing technology require a continuous supply of better suited varieties in order that the industry be competitive with other production areas. Ohio remains by far the second largest processing tomato production state in the United States.

This breeding work continues to be directed with emphasis on improvement of the whole-canned tomato (whole-pack) and tomato suitable for diced product. Other needs of the canner are being given attention in relation to these products, as well as development of improved varieties for the processor of juice, sauce and paste products.

Selection for earliness and improved fruit setting ability, especially during periods of heat stress, is being carried out to reduce the problem of split fruit set and make possible more uniform harvest-delivery schedules. With increased direct seeding, greater emphasis is being given to seed germination cold tolerance. Other important characteristics being selected to make machine harvest and bulk handling more efficient include crack resistance, firmness and ability of ripe fruit to store well on the vine for extended periods to allow maximum usable ripe fruit recovery in once-over harvest. Thus, in addition to increased productivity, a major objective is more effective utilization of yield already being attained, especially in regard to factors minimizing loss due to overripe, rotted and green fruit. Jointless pedicel (j2) is being utilized to facilitate machine harvest and allow delivery of fruit free of stems.

Improved quality factors being selected for and intensively evaluated for in cooperation with commercial processors include: acidity, pH, soluble solids,

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Professor, Assistant Professor, Assistant Professor, Branch Manager, and Agricultural Aide

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viscosity, color (crimson fruit color [$\underline{og}^c$], vitamin C, and especially fruit attributes conditioning efficient lye or steam peeling characteristics, corelessness and high case yield.

For the 1985 season, Ohio 7870 continued to be used extensively as an early-main season Verticillium-Fusarium resistant, machine harvest cultivar. It continued to exhibit excellent productivity and especially good fruit disease resistance and holding ability. Commercial yields of Ohio 7870 were excellent where harvested by hand as well as by machine. It exhibited good adaptability for the production of whole-canned coreless and diced product, as well as for pureed product.

Ohio 7814 acreage increased in 1986. It is proving to be a valuable asset as an early-main season Fusarium resistant, jointless pedicel, machine harvest type with excellent firmness, holding ability and resistance to fruit rots. It is is especially suited for coreless wholepack and diced pack, as well as pureed products. It has continued to compare well with the standard varieties and has been superior in most quality aspects for wholepack. Yields and quality through the Midwest and Canada were excellent and acreage of Ohio 7814 will increase in 1987.

In 1986, acreage increased of Ohio 832 which was released in 1985. It is main-season, early, Verticillium-Fusarium resistant with excellent productivity. Fruit have the crimson color characteristics, and are uniform ripening, crack resistant with good vine storage. It is being utilized for juice, sauce, catsup, diced product and whole-pack and continues to exhibit improved processing color, solids and viscosity. Commercial acreage being grown of Ohio 832 is already extensive through the Midwest and Canada, and is expected to increase in 1987. Commercial seed lots are available.

MATERIALS AND METHODS

Location: Vegetable Crops Branch, Fremont, Ohio.

Soil: Silty clay loam, spring bedded.

Fertilizer: 800 lb. per acre of 0-26-26, October 21; 210 lb. per acre of 34-0-0, April 28.

Herbicide: Sencor directed spray 0.5 lb. ai June 15, and again 0.5 lb. ai, July 7.

Plants: Greenhouse-grown, 108 per standard flat from seed sown April 9.

Transplanted to Field: May 27, a two-row transplanter using 21-53-0 starter at 5 lb. per 100 gal. of water; 1/2 pint per plant.

Plot Size and Spacing: One-row plots, 20 plants per row spaced 12 inches, rows 5 feet apart; Trial I, 3 replications; Trial II, 2 replications.

Insect and Disease Control: Standard recommended program followed for insect and disease control.

Weather Data (Fremont, Ohio)

	Temperature		Rainfall (inches)	
	1986	32 Yr. Avg.	1986	32 Yr. Avg.
April	51.3	48.4	3.34	3.12
May	61.1	58.9	4.52	3.50
June	67.8	68.1	3.15	3.93
July	73.4	72.3	5.35	4.01
August	66.5	70.1	2.79	3.50
September	66.1	64.0	2.83	2.93

HARVEST INFORMATION

Wet weather conditions characterized the planting period with some resultant crop damage. However, growing season precipitation was normal and this along with moderate temperatures helped insure high average yields in the commercial crop. Excellent conditions at harvest allowed delivery to the processor of a high quality crop. The Vegetable Branch trials were severely water damaged on the areas of heavier soil earlier in the season with resultant adverse effects on the trial through the season to harvest. Harvesting was with an FMC Tomato Harvester and was carried out when the entries were estimated to be at a stage of fruit ripeness in which yields of marketable fruit were approaching optimum recovery with a minimum of green and cull fruit (Tables 1 & 2). Percentages reported of fruit recovery are on a weight basis.

RESULTS

The data for the new experimental lines is organized according to maturity groups and within maturity by once-over machine-harvest fruit yield (Tables 1 & 2). Because of the complexity of factors which determine a potentially successful variety, other factors which must be considered and that can be limiting are included; eg., fruit concentration, fruit cull percentage, fruit size, stemming character, and jointlessness. It must be stressed that to adequately evaluate these lines at least one or two more years of testing will be necessary.

TABLE 1. Trial I. Field evaluation of processing tomato varieties and test lines for mechanical harvest when yields of marketable fruit were approaching optimum recovery. Vegetable Crops Branch, OARDC, Fremont, Ohio 1986.

Variety or Test Line	Ripe Usable Tons/A	Ripe Usable % of Potential	% of Potential Cull	Fruit Size (oz)	Stems %	Stems (j2-jointless) (+-jointed)
Harvest Date 8/20/86						
Heinz 6272	21.5	62	10	2.5	1	j2
Heinz 2653	13.0	49	11	2.3	3	j2
Harvest Date 8/29/86						
Heinz 7151	22.6	70	8	2.6	2	j2
Maumee	22.1	65	10	3.0	3	j2
Easy Winner	17.1	69	11	2.5	2	j2
Harvest Date 9/5/86						
Ohio 8560	27.2	78	9	2.8	9	+
Ohio 8374	24.6	72	8	2.4	0	j2
Ohio 8383	22.2	73	11	3.0	3	j2
Ohio 8431	21.5	73	11	2.5	2	j2
Ohio 8550	19.5	70	13	2.8	0	j2
Heinz 722	18.7	69	6	2.0	1	j2
Harvest Date 9/9/86						
Ohio 7983	27.8	83	10	2.1	1	j2
Ohio 8449	27.2	79	8	2.7	15	+
Ohio 8129	26.9	78	14	2.2	1	j2
Ohio 8556	26.2	80	13	2.6	1	j2
Ohio 832	25.3	72	12	3.1	45	+
Ohio 7814	23.7	74	13	2.1	0	j2
Ohio 7870	23.5	72	7	3.0	47	+
Ohio 8442	21.2	74	13	2.0	1	j2
ARCO 7E960	20.5	75	13	2.2	1	j2
Malinta	19.9	76	13	2.6	5	j2
Ohio 8239	19.6	76	11	2.5	0	j2
Ohio 8448	19.3	69	16	2.8	1	j2
FM 6203	18.8	75	15	2.7	16	+
Ohio 8643	18.7	73	14	2.2	1	j2
Ohio 8245	18.3	73	10	2.3	2	j2
Ohio 8446	17.6	71	12	2.3	1	j2
Ohio 8444	10.7	74	10	2.2	7	j2
Harvest Date 9/16/86						
Ohio 8575	23.3	79	13	2.2	0	j2
Ohio 8558	22.7	79	11	2.5	11	+
Ohio 8243	14.7	64	11	1.8	1	j2
LSD 5%	6.9	8	5	0.3	10	

TABLE 2. Trial II. Field evaluation of processing tomato varieties and test lines for mechanical harvest when yields of marketable fruit were approaching optimum recovery. Vegetable Crops Branch, OARDC, Fremont, Ohio 1986.

Variety or Test Line	Ripe Usable Tons/A	Ripe Usable % of Potential	% of Potential Cull	Fruit Size (oz)	Stems %	Stems (j2-jointless) (+-jointed)
Harvest Date 9/4/86						
Ohio 859	31.5	79	3	2.2	0	j2
Ohio 86135	24.8	78	9	2.3	6	+
Ohio 86138	24.4	73	8	2.7	0	j2
Ohio 7814	23.8	74	11	2.0	0	j2
Ohio 85107	22.0	71	12	3.1	18	+
Ohio 85118	21.8	69	6	2.2	0	j2
Ohio 8673	19.3	78	8	1.9	0	j2
Ohio 8668	18.3	78	8	1.9	0	j2
Ohio 8580	12.1	66	19	2.0	1	j2
Harvest Date 9/10/86						
Ohio 7870	27.1	66	7	3.0	41	+
Ohio 85127	24.4	71	13	3.1	0	j2
Ohio 86124	23.3	70	11	2.7	13	+
Ohio 85123	21.1	64	9	2.7	0	j2
Ohio 86137	20.8	70	18	2.9	7	+
Ohio 8684	20.6	69	9	1.9	0	j2
Ohio 86111	18.5	66	10	2.5	0	j2
Ohio 86113	16.2	63	18	2.3	0	j2
Ohio 8243	15.3	61	6	1.9	1	j2
Ohio 8693	10.2	52	6	2.3	1	j2
Ohio 832	10.1	51	23	3.1	47	+
Harvest Date 9/18/86						
Ohio 86121	26.8	77	11	2.2	0	j2
Ohio 8589	21.6	63	14	2.3	0	j2
LSD 5%	NS	NS	NS	0.5	12	

The Ohio 7983 has been extensively evaluated and is very promising as an early, high quality machine harvest jointless pedicel type suitable for wholepack or diced product. In addition to having potential in the Midwest, it has also been very promising in Canada. Commercial seed is available.

The Ohio 8129 has exhibited excellent potential in commercial plantings. it is an early-main season machine harvest jointless pedicel type suitable for wholepack or processed product. Commercial seed lots are available.

Ohio 8243 is a very productive, early main-season, jointless pedicel, machine harvest line with Fusarium wilt resistance. It is suitable for coreless wholepack, as well as diced and processed product. Ohio 8243 performed favorably in commercial trial and it appears better adapted to ligher soils. It compares very well with standard varieties and has been superior in most quality aspects for wholepack. Pilot trials will be more extensive in 1987. Commercial seed lots are available.

Ohio 8245 is a productive, early main-season, jointless pedicel machine harvest line with Fusarium and Verticillium wilt resistance. Compared to other varieties, it is superior in quality aspects for coreless wholepack, diced and other processed product. It has performed well in trial and there will be extensive trial commercial acreage in 1987. Commercial seed is available.

Ohio 8383 has excelled for earliness and productivity, having Verticillium and Fusarium wilt resistance. Quality as wholepack and diced product has been excellent. It will be more extensively tested in 1987 and commercial seed is available.

Newly advanced Bacterial Speck Resistant and Verticillium-Fusarium wilt resistant early lines Ohio 8442 and Ohio 8444 exhibited good potential and will be more extensively evaluated in 1987.

The new early Verticillium-Fusarium resistant lines Ohio 85111 and Ohio 85113 exhibited good potential, along with Fusarium resistant Ohio 85112. These will be more extensively evaluated in 1987.

Seed Sources and Cooperators

1. S.Z. Berry, Dept. of Horticulture, OSU-OARDC, Wooster, OH.
2. F. Cortelyou, Hunt-Wesson Foods, Inc., Perrysburg, OH.
3. D. Ematty, H.J. Heinz Co., 13737 Middleton Pike, Bowling Green, OH
4. C. Nichols, Ferry-Morse Seed Co., San Juan Bautista, CA.
5. W. Springer, ADI Distributors, Inc., Carmel, IN.
6. W.S. Taylor, Campbell Soup Co., Campbell Institute for Research and Technology, Napoleon, OH.

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